

BLAST INJURIES

Pediatrics



Background

After a bomb blast or explosion, health care personnel with little or no pediatric experience could be called upon to treat children. Although the general principles of emergency medicine apply when treating explosive-blast victims, all clinicians should understand there are important differences between treating adults and treating infants and children. The highlights of these treatment differences follow below.

Clinical Presentation

- **Brain and Other Neurological Injuries**

A traumatic brain injury (TBI) can occur without the patient losing consciousness. Consequently, children who appear alert and awake when first examined nevertheless should be triaged to a hospital if they exhibit any of the following:

- Abnormal behavior such as irritability or excessive sleepiness
- Persistent vomiting
- Seizures
- Loss of consciousness
- Evidence of a cerebrospinal fluid leak (CSF) leak

- **Chest Injuries**

Chest injuries, usually caused by blunt-force impact, are a common cause of death in children subjected to an explosive blast. Several anatomical features unique to children affect their injury patterns. For example:

- Children have a shorter trachea and so endotracheal intubation is more difficult, and unintentional extubation occurs more commonly.
- Children have narrower airways and as a result are more prone to bronchospasm and obstruction.
- Children have much more compliant chest walls; rib fractures are much less common and severe thoracic injuries can occur without significant external evidence of injury.
- Children have more mobile mediastinal structures. Accordingly, a tension pneumothorax can shift the mediastinum causing respiratory and cardiovascular compromise. Always consider tension pneumothorax in the hypotensive, hypoxic child.

- **Abdominal Injuries**

Children exhibit many significant anatomical differences from adults with regard to the abdomen. These can affect injury patterns as follows:

- Children are more prone to abdominal injuries because their smaller and more pliable ribs offer less protection than those in adults.
- Children have thin abdominal walls that offer them less protection.
- Children have proportionally larger organs that are more prone to injury.
- The spleen and liver are the organs most vulnerable to injury from blunt- or penetrating-force trauma.

Clinical Presentation (continued)

• Orthopedic Injuries

Common orthopedic injuries in children include:

- Plastic deformity—bowed bone without evidence of cortical disruption.
- Torus (buckle) fracture—bending of the cortex.
- Greenstick fracture—fracture of one cortex at the side opposite of force impact.
- Physeal fracture—involving the physis (growth plate). Physeal fractures represent approximately 18% of pediatric fractures.
- Forearm fracture—involving radius and ulna and usually occurs after falls.
- Supracondylar fracture—involving distal humerus and elbow is considered an orthopedic emergency. A careful neurovascular exam is necessary to detect potential damage to the brachial artery.

• Critical Care

Several factors unique to children affect their critical care. These include:

- Temperature regulation is important because children are more susceptible to heat loss by radiation, convection, and evaporation.
- Young children have relatively large heads with immature neck musculature. This makes them more susceptible to cervical spine injury caused by the fulcrum effect in the C1–C3 area.
- Children under age 8 years also are susceptible to SCIWORA (spinal cord injury without radiographic abnormality).
- Traumatic asphyxia occurs almost exclusively in children. It results from sudden compression of the abdomen or chest against a closed glottis. Treatment is supportive. Symptoms of traumatic asphyxia include:
 - Hyperemic sclera
 - Seizures
 - Disorientation
 - Petechiae in upper body
 - Respiratory failure

Initial Management

- Consider possible cervical spine injury in children with head injury.
- Repeat examinations are essential because young children often are not able to cooperate with their initial examiner.
- Children have a remarkable cardiovascular reserve; even minimal signs of shock will not occur until 25% of blood volume is lost. Recommended initial fluid resuscitation is 20–30 cc/kg of normal saline or Ringer's lactate.

Other Considerations

- Decontaminate children in the presence of parents whenever possible to minimize disruption and reduce the possibility of separation anxiety.
- Mental health issues are common in children who have experienced a traumatic event such as a bomb blast. If parents are accessible, provide them with mental health referral sources.
- For further information on psychological first aid for children and families, please refer to CDC's fact sheet "Blast Injuries: Bombings and Mental Health."

This fact sheet is part of a series of materials developed by the Centers for Disease Control and Prevention (CDC) on blast injuries. For more information, visit CDC on the Web at: www.emergency.cdc.gov/BlastInjuries.